YARN END SUCTION DEVICE OF LOOM

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to a yarn end suction device of a shuttleless loom, which is provided with a suction mouth for sucking and capturing the tip of an entered weft yarn in the neighborhood of a weaving end on the yarn feed side or the opposite yarn feed side, and for discharging to the exterior an unnecessary yarn end portion cut by a cutter.

DESCRIPTION OF THE RELATED ART

As a substitute for a catch cord for holding a weft yarn end portion, which has been entered from the yarn feed side and reached the opposite yarn feed side, near the outside of a cutter disposed near the outside of a weaving end until the weft yarn end portion is cut by the cutter, a yarn end suction device is often used.

As the background thereof, there have been problems that, when the catch cord is used, restoration becomes necessary upon occurrence of breakage of the catch cord, maintenance such as restoration upon occurrence of breakage of the weft yarn is bothersome, and further, after cutting the weft yarn end portion by the cutter, there occurs excessive yarn consumption caused by discarding the catch cord along with the cut weft yarn end portion.

For solving these problems, a conventional yarn end suction device has a cylindrical sucking appliance of which a

suction port comprises a first suction port for taking in a weft yarn and a second suction port for retaining the weft yarn, wherein the first and second suction ports communicate with each other so as to allow the weft yarn to move in the first and second suction ports in the state where the weft yarn is sucked. Further, the second suction port is made smaller in diameter than the first suction port and is formed as, for example, a slit for securely retaining the weft yarn (e.g. see Patent Literature 1).

[Patent Literature 1]

JP-A-2000-328399 (pp. 3-4, Figs. 5-6)

According to the foregoing structure, however, there has been a problem that although the weft yarn can be stably retained in the second suction port, since the tip of the weft yarn behaves violently in the sucking appliance even after the weft yarn is introduced into the sucking appliance, a posture of the weft yarn is not securely stabilized to make tension of the weft yarn unstable, to thereby cause a cutting error. Further, there has also arisen a problem that when a suction force is increased for preventing violent behavior of the tip of the weft yarn, the fluid consumption amount is raised.

SUMMARY OF THE INVENTION

Therefore, it is an object of the present invention to provide a yarn end suction device of a loom, which can suppress a fluid consumption amount and prevent occurrence of a cutting

error when sucking a weft yarn via a suction mouth disposed near the outside of a weaving end and discharging an unnecessary yarn end portion cut by a cutter to the exterior.

For accomplishing the foregoing object, the present invention is based on a yarn end suction device of a loom, wherein a weft yarn carried by a beating motion is sucked and captured via a suction mouth disposed near the outside of a weaving end, then the weft yarn is cut by a cutter provided between the weaving end and the suction mouth, and thereafter, a weft yarn end portion is discharged to the exterior.

The invention of claim 1 is characterized in that the yarn end suction device of the loom is provided with the suction mouth having a suction port that is formed so as to have a polygonal cross-sectional shape at its end portion, and one corner thereof is disposed so as to be directed toward the weaving end side.

Herein, the phrase of "the suction mouth having a suction port that is formed so as to have a polygonal cross-sectional shape at its end portion" represents that the cross-sectional shape may be triangular or more polygonal. In terms of the number of processing steps, the cross-sectional shape is preferably triangular. There is no particular limitation about the shape of a triangle so that it may be a regular triangle, an isosceles triangle, or a scalene triangle.

With the foregoing structure, since the weft yarn is sucked into the suction mouth while being bent, and retained while

contacting the corner of the polygon of the suction port, it is possible to accurately set a position of the weft yarn relative to the cutter so that the weft yarn can be retained more stably. Further, since tension of the weft yarn is stabilized, a cutting error by the cutter can be prevented. Moreover, since the retention of the weft yarn is strengthened, it is possible to suppress suction air flow required for retaining the weft yarn, and therefore, energy saving can be achieved.

The invention of claim 2 is characterized in that the yarn end suction device of the loom is provided with the suction mouth that is formed, at a portion of the inner circumference of an end portion of a suction port, with a recessed portion that is recessed outward from the center of an opening, and the recessed portion is disposed so as to be directed toward the weaving end side.

Herein, there is no particular limitation about the shape of the suction port so that it may be circular, deformed circular, oval, polygonal, or others. Further, with respect also to the shape of the recessed portion, it may be a V-shape, a round groove, an angular groove, or others. With respect also to a pitch of an inner wall of the recessed portion, there is no particular limitation as long as a space is ensured for the weft yarn to easily enter it. Preferably, the recessed portion is formed so as to extend in an axial direction of the suction mouth from an upper end thereof, i.e. formed like a so-called groove. With respect to an extending length of the recessed portion, there is no particular limitation so

that it may be formed over the whole length of the suction mouth, or it may be formed longer or shorter than the weft yarn end portion.

With the foregoing structure, since the weft yarn is sucked into the suction mouth while being bent, and retained while contacting the recessed portion of the suction port, it is possible to accurately set a position of the weft yarn relative to the cutter so that the weft yarn can be retained more stably. Further, since the weft yarn end portion contacts the inner wall of the axially extending recessed portion to improve frictional resistance, the weft yarn can be retained furthermore stably and securely. Therefore, it becomes possible to further stabilize tension of the weft yarn to thereby securely prevent occurrence of the weft yarn cutting error by the cutter.

According to the invention of claim 3, a guide having a control surface extending in a beating direction for regulating the weft yarn carried by the beating motion is disposed between the weaving end and the cutter, and the suction mouth is disposed in a position where the weft yarn having passed through the control surface by the beating is bent, and sucked and captured. Consequently, until the weft yarn is cut by the cutter, the weft yarn can be captured by bending it doubly on both sides of the cutter via the control surface of the guide and the corner or the recessed portion of the suction port of the suction mouth, so that the weft yarn end portion can be retained further securely and stably to

thereby prevent occurrence of the cutting error reliably.

According to the invention of claim 4, the guide is formed with a slit that is opened in three directions including a front side confronting a reed, a warp side, and a side of the cutter for cutting the weft yarn to thereby receive the beaten weft yarn, and the control surface is formed by the slit. Consequently, if one configured as a tuck-in selvage forming device is employed for the guide, it is not necessary to provide a dedicated guide. Further, since the weft yarn is captured and retained stably and firmly, slacking of the weft yarn can be prevented upon cutting the weft yarn by the cutter, to thereby securely cut the weft yarn, and further, it becomes possible to make uniform selvage widths (foldback selvage lengths) so that the ear quality can be further improved. Herein, the tuck-in selvage forming device may be of the needle type or the needleless type.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1A is a side view showing a yarn end suction device of the present invention;

Fig. 1B is an enlarged view showing the main part of Fig. 1A;

Fig. 2A is a rear view showing of the yarn end suction device of the present invention, seen in a direction indicated by an arrow A in Fig. 1A;

Fig. 2B is an enlarged view showing the main part of Fig.

2A;

Fig. 3A is a rear view showing a yarn end suction device of the present invention;

Fig. 3B is an enlarged view showing the main part of Fig. 3A;

Figs. 4A to 4D are plan views respectively showing examples of cross-sectional shapes of end portions of suction ports of suction mouths; and

Figs. 5A and 5B are partly omitted perspective views respectively showing examples of shapes of suction mouths.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Now, preferred embodiments of the present invention will be described hereinbelow with reference to the drawings.

Figs. 1A, 1B, 2A, and 2B show a yarn end suction device 1 of the present invention as applied to an air jet loom. Figs. 1A to 2B show an example wherein the yarn end suction device 1 of the present invention is added to a so-called needleless tuck-in device 6 that turns back a weft yarn into a warp opening by an air jet, and illustrate peripheral portions of the yarn end suction device 1 disposed at a weaving end on the opposite weft entering side. Figs. 1A and 1B are both outside views seen from a side (opposite weft entering side) of the loom, and Fig. 1B is an enlarged view of the main part thereof. On the other hand, Figs. 2A and 2B are both outside views seen from the rear of the loom,

and Fig. 2B is an enlarged view of the main part thereof. As shown in Figs. 2A and 2B, in the neighborhood of the outside of a reed 3 on the opposite yarn feed side thereof which moves backward and forward with a beating motion, the needleless tuck-in device 6 and the yarn end suction device 1 of the present invention are arranged in order. A cutter 4 for cutting a weft yarn is disposed between the needleless tuck-in device 6 and a suction mouth 5 serving as a suction port of the yarn end suction device 1. In the shuttleless loom, a weft yarn 2a is entered into an opening the warp shed from the yarn feed side by the use of a weft entering device (not shown), thereby to feed the weft yarn 2a to the opposite yarn feed side. Following a beating motion of the reed 3, the weft yarn 2a that was entered and reached the opposite yarn feed side is carried to a cloth fell side of a fabric and formed into the fabric. In this event, a weft yarn end portion 2b having reached the opposite yarn feed side is sucked to be captured and retained by the yarn end suction device 1 disposed near the cloth fell side. Then, the weft yarn 2a is cut by the cutter 4, and the cut weft yarn end portion 2b is discharged to the exterior by the yarn end suction device 1.

The yarn end suction device 1 of the present invention roughly comprises the suction mouth 5 disposed on an outer side than the cutter 4, and an ejector 9 for generating suction air flow at a suction port 7 of the suction mouth 5. A lower end portion of the suction mouth 5 is connected to the ejector 9, and an inlet port

11 is connected to the ejector 9 via an intake duct 10. Further, the ejector 9 is provided with a discharge port 12 for discharging the weft yarn end portion 2b cut by the cutter 4 to the exterior. The inlet port 11 is supplied with compressed air via a pipe (not shown), while the discharge port 12 is connected with a yarn end recovery container (not shown) located on the exterior via a pipe (not shown). The suction mouth 5, the inlet port 11, and the discharge port 12 communicate with each other inside the ejector 9. Accordingly, the suction of the weft yarn 2a into the suction mouth 5 is implemented by the ejector 9 connected to the lower end of the suction mouth 5, wherein the air is fed into the ejector 9 from the inlet port 11 via the intake duct 10 and then discharged from the discharge port 12 so that a negative pressure is generated in a flow passage on the side of the suction mouth 5 to thereby suck the weft yarn end portion 2b.

The suction mouth 5 is formed with the suction port 7 at the upper end thereof, has a tubular shape with a regular triangle in cross section, and extends downward while being curved. The suction port 7 has a corner 8a directed toward a weaving end side and located such that the entered weft yarn 2a is sucked and captured perpendicularly downward. Herein, the bending direction of the weft yarn 2a is not limited to the downward direction, but may also be an upward direction or a fabric rolling direction, and the location of the suction mouth 5 may be changed according to the bending direction of the weft yarn 2a. There is no particular

limitation about a bending angle of the weft yarn 2a as long as it is within the range of 10° to 170°, but it is preferably set to 90° (right angle) or angle near 90° for retaining the weft yarn 2a securely and stably. There is no particular limitation about a cross-sectional shape of the suction mouth 5 as long as it is polygonal, but the triangle of this embodiment is preferable because of easy formation from a cylinder. In this embodiment, the suction mouth 5 is formed so as to extend while being curved. However, the present invention is not particularly limited thereto. Further, in this embodiment, the suction port 7 is inclined downward toward the rear side so that the weft yarn end portion 2b can easily get into the suction mouth 5. However, the present invention is not particularly limited thereto.

The needleless tuck-in device 6 is formed by a block body 13 having a slit 14. The block body 13 is adjustable in position relative to a loom frame (not shown), and extends vertically along a warp direction. The slit 14 is opened in three directions including the front side confronting the reed 3, the warp side, and the side of the cutter 4 for cutting the weft yarn 2a, and can regulate and receive the weft yarn 2a carried by the beating motion. Deep in the slit 14, there is provided a nozzle-like open hole 15 that is opened toward the front side of the slit 14, and serves to blow off the weft yarn 2a retained inside the slit 14 toward the front of the slit 14. Further, a side surface of the block body 13 forming the slit 14 and facing the weaving end of the

fabric is provided with a plurality of, for example, four, nozzle-like guide holes 16 directed toward the weaving end of the fabric. In the front of the slit 14, an inclined guide surface 17 continuous therewith is formed so as to be opened toward the warp side. Further, the open hole 15 and the guide holes 16 communicate with nipples 18 attached to the outer periphery of the block body 13 via respective independent ports (not shown), and are connected to a pressure air source (not shown) via open/close valves (not shown) that are provided corresponding to the open hole 15 and the guide holes 16, respectively, and opened or closed according to rotation of a main shaft of the loom.

The weft yarn 2a that has been normally entered advances into the slit 14 via the guide surface 17 following the beating motion of the reed 3, and is retained in a cutting region (not shown) of the cutter 4. The weft yarn 2a inserted into the slit 14 is regulated by upper and lower surfaces of the slit 14 so as to be vertically restrained. That is, the slit 14 serves as control surfaces. Then, the weft yarn 2a is sucked into the suction port 7 of the suction mouth 5 disposed outside the cutter 4 so as to be bent into an L-shape, wherein the weft yarn 2a is bent at two portions, i.e. a side portion of the lower surface of the cutter 4 and the corner 8a of the suction port 7 of the suction mouth 5, so that the weft yarn 2a is retained stably and securely. Thereafter, an upper blade of the cutter 4 is closed synchronously with the rotation of the loom main shaft to cut the weft yarn 2a.

After the cutting of the weft yarn 2a by the cutter 4, the cut short weft yarn end portion 2b is discharged into the yarn end recovery container located on the exterior of the yarn end suction device 1, via the ejector 9. Subsequently, when the warp forms an opening for the next entering of the weft yarn 2a, the air from the pressure air source is fed to the open hole 15 and the guide holes 16 via the respective ports by the operations of the open/close valves in the needleless tuck-in device 6. Then, since the open hole 15 ejects the air forward, the weft yarn end portion 2b is forced out forward along the slit 14 so as to be blown off and, since the guide holes 16 eject the air toward the opening of the warp, the weft yarn end portion 2b being blown off forward from the cloth fell side is folded back into the opening of the warp so that a formation of a tuck-in selvage can be formed at the weaving end of the fabric.

Figs. 3A and 3B show another embodiment of a yarn end suction device 1 of the present invention, which differs from the embodiment of Figs. 2A and 2B in that a cross-sectional shape of a suction mouth 5 is circular, a recessed portion 8b that is recessed outward from the center of an opening of the suction mouth 5 is formed at a portion of the inner circumference of a suction port 7, and the recessed portion 8b is directed toward the weaving end side and extends in an axial direction of the suction mouth 5 from its upper end to its lower portion in the form of a groove. By forming the recessed portion 8b in the form of the

groove, it is possible to prevent violent behavior of the weft yarn end portion 2b within the suction mouth 5 to further stabilize a posture of the weft yarn end portion 2b, thereby to securely capture and retain the weft yarn end portion 2b.

Figs. 4A to 4D show examples of cross-sectional shapes of suction ports 7 of suction mouths 5, respectively, wherein a recessed portion 8b that is recessed outward from the center of an opening is formed at a portion of the inner circumference of the suction port 7. In Fig. 4A, the suction port 7 is formed circular, and a V-shaped recessed portion 8b is formed at a portion thereof so as to be continuous therewith. In Fig. 4B, the suction port 7 is formed in the shape of a deformed circle, and a rectangular recessed portion 8b is formed at a portion thereof so as to be continuous therewith. In Fig. 4C, the suction port 7 is formed rectangular, and a semicircular recessed portion 8b is formed at a portion thereof so as to be continuous therewith. In Fig. 4D, the suction port 7 is formed triangular, and a V-shaped recessed portion 8b is formed at one corner thereof so as to be continuous therewith. With respect to a pitch of an inner wall of the recessed portion 8b, there is no problem as long as a space is ensured that can allow easy suction and stable retention of the weft yarn end portion 2b. Preferably, it is desirable that the shape of the recessed portion 8b is narrowed toward its outer tip portion so as to allow secure positioning of the weft yarn end portion 2b relative to the cutter 4.

Figs. 5A and 5B show examples of shapes of suction mouths 5, respectively, wherein a shape of a suction port 7 is such that a V-shaped recessed portion 8b that is recessed outward from the center of an opening is formed at a portion of the inner circumference of a circle. The V-shaped recessed portion 8b may be formed so as to extend in the form of a groove over the whole length of the suction mouth 5 as shown in Fig. 5A, or a groove of the recessed portion 8b may be formed triangular so as to be gradually shallower from an end of the suction port 7 toward a lower portion of the suction mouth 5 as shown in Fig. 5B.

The yarn end suction device 1 of the present invention is not limited to the structures of the foregoing embodiments comprising the suction mouth 5 and the needleless tuck-in device 6, but may comprise a suction mouth and a needleless tuck-in device, or a suction mouth and a guide not provided with a tuck-in function. Incidentally, the yarn end suction device 1 is disposed in the neighborhood of the weaving end on an extended line of the cloth fell side.

According to the invention of claim 1 or 2 among the present inventions, a suction mouth provided with a suction port at an upper end thereof is disposed near the outside of a weaving end, a shape of the suction port is formed polygonal or a recessed portion that is recessed outward from the center of an opening is formed at a portion of the inner circumference of the suction port, and a corner of the polygon or the recessed portion of the suction

port is directed toward the weaving end side, thereby to suck a weft yarn into the suction mouth while being bent and retain the weft yarn while contacting the corner of the polygon or the recessed portion of the suction port. Therefore, it is possible to accurately set a position of the weft yarn relative to the cutter so that the weft yarn can be stably retained. Further, since tension of the weft yarn is stabilized, a cutting error by the cutter can be prevented. Moreover, since the retention of the weft yarn is strengthened, it is possible to suppress the suction air flow required for retaining the weft yarn, and therefore, energy saving can be achieved.

According to the invention of claim 3 among the present inventions, a guide is disposed between the weaving end and the suction mouth, and provided with a control surface extending in a beating direction for regulating the weft yarn carried by a beating motion, and the suction mouth is disposed in a position where the weft yarn passing through the control surface is bent, and sucked and captured. Therefore, until the weft yarn is cut by the cutter, the weft yarn can be captured by bending it doubly on both sides of the cutter via the control surface and the corner or the recessed portion of the suction port of the suction mouth, so that the weft yarn end portion can be retained further securely and stably to thereby prevent occurrence of the cutting error reliably.

According to the invention of claim 4 among the present inventions, the control surface provided in the guide is formed by a

slit that is opened in three directions including the front side confronting a reed, the warp side, and the side of the weft yarn cutting cutter. Consequently, if one configured as a tuck-in selvage forming device is employed for the guide, it is not necessary to provide a dedicated guide. Further, combined with the foregoing effects, it is possible to provide a loom that can form an selvage formation highly excellent in quality.